TECHNOLOGY NEEDS/OPPORTUNITIES STATEMENT

IMPROVED, REAL-TIME FIELD SCREENING DURING EXCAVATION FOR HEAVY METALS WITH EMPHASIS ON THE FOLLOWING: LEAD, CHROMIUM, MERCURY, ARSENIC, AND BARIUM

Identification No.: RL-SS13
Date: September 2001

Program: Environmental Restoration
OPS Office/Site: Richland Operations Office/Hanford Site
Operable Unit(s): Selected soil sites in the 100 and 300 Areas.
PBS No.: RL-RC01 (RL-ER01), RL-RC02 (RL-ER03)
Waste Stream: Disposition Map Designations: ER-04 [technical risk score 3], ER-03 [technical risk score 3]
TSD Title: N/A
Waste Management Unit (if applicable): N/A
Facility: N/A

***Priority Rating*:**

This entry addresses the "Accelerated Cleanup: Paths to Closure (ACPC)" priority:

____ 1. Critical to the success of the ACPC
_X_ 2. Provides substantial benefit to ACPC projects (e.g., moderate to high lifecycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays)
____ 3. Provides opportunities for significant, but lower cost savings or risk reduction, and may reduce uncertainty in ACPC project success

***Need Title*:** Improved, Real-Time Field Screening During Excavation for Heavy Metals with emphasis on the Following: Lead, Chromium, Mercury, Arsenic, and Barium

Need/Opportunity Category: Technology Opportunity

***Need Description*:** Rapid, field screening techniques are needed to guide remedial excavation and to ensure that excavated materials meet waste acceptance criteria prior to disposal. Primary metal contaminants of concern include lead, chromium, mercury, arsenic, and barium

Schedule Requirements:

Earliest Date Required: 8/1/99

Latest Date Required: 9/30/18

Soil Remediation is ongoing. Characterization and remediation of the 200 Area sites has begun and is expected to continue through 2018.

***Problem Description*:** Millions of cubic yards of contaminated soils are slated for excavation and on site disposal. Generally, radioactive contaminants in these soils are the primary drivers for remediation and detection of heavy metals for excavation guidance is not required. However, in some cases, heavy metal contamination exists outside the area of gamma-emitting radioactive contamination and must be detected to guide excavation for closure of a site. Heavy metals are common co-contaminants in these soils and may control the ability to cost effectively dispose of the materials on site. Soils that contain these heavy metal contaminants but do not fail the TCLP test are quickly and cost-effectively disposed. Soils that fail the TCLP test either require treatment or time consuming treatment variances. If TCLP results were easy to obtain, soils could be segregated into materials requiring additional treatment and those that could be directly disposed. However, the current long turn around time for TCLP analyses has caused operational inefficiencies and higher costs. For example, during excavation of Landfill 1D and Burial Ground 618-4 in the 300 Area, soils contaminated with leachable forms of lead were discovered. Due to TCLP test turnaround times, the soils are excavated, sampled, stockpiled and loaded into disposal transportation containers after TCLP results are obtained. Barium contamination is not as widespread as lead but barium contaminated soils that fail the TCLP test have also been found in the 618-4 burial ground. Other heavy metals that are a potential concern but have not failed TCLP in soils excavated to date include chromium, arsenic, and mercury.

Effective soil screening can be conducted if 20 times the allowable TCLP leachate concentration can be detected in the soil. If the soil concentrations of RCRA metals are below these levels, they cannot fail the TCLP test. Detection techniques that could accurately detect these concentrations within an hour would be an improvement over the current XRF baseline. However, this screening method is conservative because significant concentrations of some hazardous metals are stable in soil matrixes and will not readily leach. A cost-effective test that can predict TCLP results within a few hours would be a better, less conservative soil screening technique. Predictive TCLP tests that reduce the turn around time to two days or less would be a worthwhile improvement to the current long TCLP turnaround time.

Benefit to the Project Baseline of Filling Need: Improved technologies may have cost and schedule savings compared to the current XRF screening technology and slow turnaround TCLP testing.

***Functional Performance Requirements*:** Detection technologies must be portable, easy to use, produce little or no secondary waste and provide near real-time field screening or quick turnaround results that correlate to TCLP results. Detection to levels that would allow for real time worst case Land Disposal Restricted (LDR) determinations (e.g. 20 times Toxic Characteristic Leaching Procedure (TCLP) limits) are required for these metal contaminants. Detection level targets based on soil cleanup goals from the Remedial Design Report/Remedial Action Work Plan for the 100 Area (DOE/RL-96-17 rev. 2): are as follows: lead (10.2 mg/kg), chromium (2.0 mg/kg), mercury (0.33 mg/kg), arsenic (20 mg/kg), and barium (132 mg/kg). Techniques that would allow accelerated (e.g. less than two days) TCLP results are also desired.

Work Breakdown Structure (WBS) No. : 1.4.03.1.1 (RL-RC01) ***TIP No.:*** N/A
1.4.03.1.2 (RL-RC02)

Relevant PBS Milestone: PBS-MC-026, PBS-MC-027, PBS-MC-028

***Justification For Need*:**

Technical: Current technology (XRF technology) can measure high-end concentrations but new technology is needed to accurately measure concentrations at the target levels.

Regulatory: None

Environmental Safety & Health: Rapid screening techniques will reduce worker exposure times and help assure that soils that do not meet LDR are properly managed.

Potential Life-Cycle Cost Savings of Need (in $000s) and Cost Savings Explanation: The estimated life-cycle cost savings associated with filling this need is $1M. This estimate is based on an assumed savings of 0.1% of the total cost for the 100 Area of $900M.

Cultural/Stakeholder Concerns: None.

Current Baseline Technology: XRF and discrete sampling.

Cost: Cost of equipment and analyses are minimal but hidden costs related to reduced excavation efficiency could be substantial.

Cost per unit: Not determined.

Waste: Laboratory waste generated from discrete sampling.

How Long It Will Take: Soil remediation activities will extend to 2018 in the 200 Area.

End-User: Richland Environmental Restoration Project

Site Technical Point-of-Contact: Scott W. Petersen, BHI, (509) 372-9126; John April, BHI, (509) 372-9632; Ashur R. Michael, BHI, (509) 372-9074; Michael J. Truex, PNNL, (509) 376-5461

Contractor Facility/Project Manager: V. R. (Vern) Dronen (100 and 300 Areas), BHI, (509) 372-9075; Michael J. Graham (200 Area), BHI (509) 372-9179

DOE End-User/Representative Point-of-Contact: Arlene C. Tortoso DOE, (509) 373-9631; Robert G. Mcleod, DOE, (509) 372-0096; Glenn I. Goldberg, DOE, (509) 376-9552; Owen Robertson, DOE, (509) 373-6295